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10/521,516	01/18/2005	Thilo Weitzel	298-278	2106

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EXAMINER	
TURNER, SAMUEL A	
ART UNIT	PAPER NUMBER
2877	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/521,516	WEITZEL, THILO	
	Examiner	Art Unit	
	Samuel A. Turner	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *49-88* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *49-88* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/26/07*. 8/30/2007
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement(s) submitted on 30 August 2007 and 26 September 2007 have been considered by the Examiner.

Title

The amended title of the invention is still not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: diffractive interferometric optical device for measuring spectral properties of light..

Abstract

The abstract of the disclosure is objected to because the language is general and fails to provide a concise statement of the technical disclosure. Correction is required. See MPEP § 608.01(b).

Applicant is reminded of the proper content of an abstract of the disclosure.

A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. In certain patents, particularly those for compounds and compositions, wherein the process for making and/or the use thereof are not obvious, the abstract should set forth a process for making and/or use thereof. If the new technical disclosure involves modifications or alternatives, the abstract should mention by way of example the preferred modification or alternative.

The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

Where applicable, the abstract should include the following:
(1) if a machine or apparatus, its organization and operation;
(2) if an article, its method of making;
(3) if a chemical compound, its identity and use;
(4) if a mixture, its ingredients;
(5) if a process, the steps.

Extensive mechanical and design details of apparatus should not be given.

Specification

The is objected to because the brief description of the drawings fails to provide a description of the actual drawing, not a mere statement of prior art or invention. The statement "according to one embodiment" is an indication of the number of embodiments, not a description of actual subject matter. See MPEP 608.01(f).

The disclosure is objected to because of the following informalities: the specification contains spelling and typographical errors such as "angel of diffraction" and in paragraph [0190] "Fig. 7" should be -Fig. 8-. Appropriate correction is required. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Paragraphs 97, 108, 127, 149, 162, and 187 include the phrase "by the claimed methods of calculation". The methods of calculation must be incorporated into the specification in order to provide antecedent basis for the claims. The

subject matter must find support from the originally claimed method, not the method as now claimed to avoid adding any new matter.

At paragraph 173 the term "dieder" has not been translated.

The amendment filed 30 September 2007 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: the term subfield or sub field, or the phrase "changing the shape or a direction of propagation of the wavefront of at least one of said subfields in dependence on the wavelength" are not present in the original disclosure. Other terminology, such as the "weighted sum" from paragraph [0204], is found in the amended specification but lacks support in the original. The specification must be reviewed and any new terminology corrected or support for the new terms shown by reference to the original specification.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Objections

Claims 50, 59, 67-69, 71, 77, and 86 are objected to under 37 CFR 1.75(c).

In claims 50, 68, and 69 there is no antecedent basis for "said modified interference pattern". Claim 49 provides antecedent basis for "an interference pattern ".

Claims 59, and 67-69 fail to end with a period.

In claim 71 the period after "interference pattern" must be deleted.

In claim 77 the term "dieder" has not been translated.

In claim 86 the additional period after "said subfields" must be deleted.

Claim Rejections - 35 USC § 112, first paragraph

The following is a quotation of the first paragraph of 35 U.S.C. § 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 49-88 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claims 49 and 81 the phrase "means for changing one of a shape or a direction of propagation of the wavefront" is new matter. The original specification and claims fails to disclose a means for changing the shape of the wavefront.

In claims 49-88 the term "subfield" is new matter. The original specification and claims refers only to intensity or wavefront splitting.

In claim 81 the term "discriminative wavelengths" has no support in the original specification.

In claim 83 the phrase "decomposition of said numerical representation of said interference pattern" has no support in the original specification.

Claim Rejections - 35 USC § 112, second paragraph

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 54, 62, and 87 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 54 conflicts with claim 52. In claim 52 the detection means includes the mask, while in claim 54 the detection means is combined with the mask.

Claim 62 contains an improper Markush group. It is improper to use the term "comprising" instead of "consisting of." Ex parte Dotter, 12 USPQ 382 (Bd. App. 1931).

Claim 87 conflicts with claim 81. Claim 87 uses numerical transformations or functions of said numerical representation of interference patterns and said base patterns instead of said numerical representation of interference pattern and said base patterns. Claims 81 and 83 are limited to using said numerical representation of interference pattern and said base patterns

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 49-88 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Weitzel(WO0062026) in view of Sampei et al(5,933,235).

Fig. 9

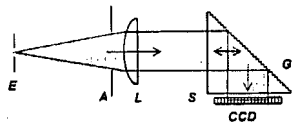


Fig. 10

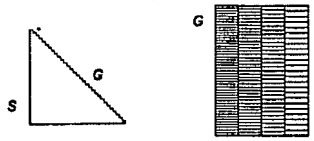


Fig. 11

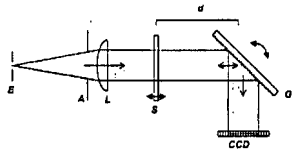


Fig. 14

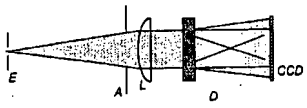


Fig. 15

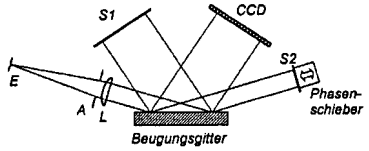
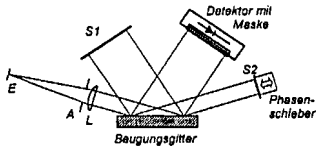


Fig. 16



With regard to claim 49, Weitzel teaches an interferometric apparatus for performing optical spectroscopy with high spectral resolution in a compact arrangement(Fig's 9,11,14-16), the apparatus comprising:

(a) means for coupling an incoming light field to be examined(Fig. 15, E);

(b) means for splitting said incoming light field into at least two subfields(**Fig. 15, grating**);

(c) means for changing one of a shape or a direction of propagation of the wavefront of at least one of said at least two subfields in dependence on the wavelength(**Fig. 15, grating**);

(d) means for generating an interference pattern by superimposing said at least two subfields(**Fig. 15; grating,S1,S2**);

(e) detection and analysis means to record and evaluate said interference pattern at a plurality of discrete spatial positions in order to derive spectral properties of said incoming light field(**Fig. 15, CCD; pages 17-20**).

Weitzel **fails to teach** means for coupling in a single spatial mode of an incoming light field to be examined.

As to claim 50/49, Weitzel teaches wherein said detection and analysis means to record and evaluate said interference pattern comprises detection means for recording an intensity of said modified interference pattern at a plurality of discrete spatial positions(**Fig. 15, CCD**); and numerical analysis means for reconstructing an optical spectrum or spectral properties of said incoming light field by performing calculations on said recorded intensities(**page 17**).

As to claim 51/49, Weitzel teaches wherein said detection and analysis means to record and evaluate said interference pattern comprises detection means for recording a weighted sum of the intensities of said interference pattern at a

plurality of discrete spatial positions in order to identify an optical spectrum or spectral properties of said incoming light field according to a predetermined set of said weights(Fig. 16, mask).

As to claim 52/51, Weitzel teaches wherein said detection means for recording a weighted sum of the intensities includes a spatial mask which correlates with at least one generated interference pattern to be detected(Fig. 16, mask).

As to claim 53/52, Weitzel teaches wherein said spatial mask is one of a fixed form and a changeable form(Fig. 16, mask).

As to claim 54/52, Weitzel teaches wherein said detection means is combined with said spatial mask for detecting a spatial modulation(Fig. 16, mask).

As to claim 55/49, Weitzel teaches wherein said means for splitting said incoming light field into said at least two subfields further comprises means for dividing the amplitude of said incoming light field into at least two subfields(Fig. 15, grating).

As to claim 56/49, Weitzel teaches wherein said means for splitting said incoming light field to at least two subfields further comprises means for dividing the wavefront of said incoming light field into said at least two subfields(Fig. 14, D).

As to claim 57/49, Weitzel fails to teach wherein said means for coupling in said single spatial mode of an incoming light field to be examined, comprises a spatial filter configured to permit a single spatial mode.

As to claim 58/49, Weitzel **fails to teach** wherein said means for coupling in said single spatial mode of an incoming light field to be examined, further comprises an optical mono mode fiber.

As to claim 59/49, Weitzel teaches wherein said means for changing the shape or the direction of propagation of the wavefront of at least one of said two subfields in dependence on the wavelength comprises a spectrally dispersive optical element(**Fig. 15, grating**).

As to claim 60/49, Weitzel teaches wherein said means for changing the shape or the direction of propagation of the wavefront of at least one of said two subfields in dependence on the wavelength comprises a diffractive optical element(**Fig. 15, grating**).

As to claim 61/60, Weitzel teaches wherein said diffractive optical element has non-periodic diffraction structures(**page 11**).

As to claim 62/60, Weitzel teaches wherein said diffractive element is selected from the group comprising: a multiplex grating, a multiplex hologram, a holographic optical element, and a computer-generated hologram(**claim 19**).

As to claim 63/49, Weitzel teaches wherein said means for splitting an incoming light field into said at least two subfields and said means for changing the shape or the direction of propagation of the wavefront of at least one of said two subfields in dependence on the wavelength share at least one common optical element(**Fig. 15, grating**).

As to claim 64/49, Weitzel teaches wherein the detection means is configured to move through the interference pattern with respect to a single spatial degree of freedom for recording an intensity of said interference pattern at said plurality of discrete spatial positions(page 6).

As to claim 65/49, Weitzel teaches wherein the detection means is moved through the interference pattern with respect to two spatial degrees of freedom for recording an intensity of said interference pattern at said plurality of discrete spatial positions(page 6).

As to claim 66/49, Weitzel teaches wherein the interference pattern is directed onto the detection means via optical elements moveable with respect to one spatial degree of freedom for recording an intensity of said interference pattern at said plurality of discrete spatial positions of said interference pattern(Fig. 15, S2).

As to claim 67/49, Weitzel teaches wherein the interference pattern is directed onto the detection means via optical elements moveable with respect to two spatial degrees of freedom for recording an intensity of said interference pattern at said plurality of discrete spatial positions of said interference pattern(Fig. 11, G).

As to claim 68/49, Weitzel teaches wherein the detection means is one of a spatially one-dimensional resolving detector or a one- dimensional detector array for recording said intensities of said modified interference pattern at said plurality of discrete spatial positions(claim 5).

As to claim 69/49, Weitzel teaches wherein the detection means is one of a spatially two-dimensional resolving detector or a two- dimensional detector array for recording said intensities of said modified interference pattern at said plurality of discrete spatial positions(Fig. 15, CCD).

As to claim 70/49, Weitzel teaches means to change the optical path length for at least one of said subfields before being superimposed to generate said interference pattern(Fig. 15, S2).

As to claim 71/49, Weitzel teaches means to influence the optical path length for at least one of said subfields before being superimposed to generate said interference pattern, in dependence on the wavelength(Fig. 15, S2).

As to claim 72/49, Weitzel teaches means to shift or modulate the relative phase of at least one of said at least two subfields with respect to at least one other of said at least two subfields being superimposed to generate said interference pattern(Fig. 15, S2).

As to claim 73/49, Weitzel teaches means to change or modulate a spatial position of at least one of said two subfields with respect to at least one other of said at least two subfields(Fig. 15, S2).

As to claim 74/49, Weitzel teaches means to change or modulate the spatial position of said single spatial mode of said incoming light field(Fig. 15, S2).

As to claim 75/49 Weitzel teaches means to form an optical resonator(Fig. 9).

As to claim 76/75, Weitzel teaches wherein one or more of said means for changing one of a shape or a direction of propagation of the wavefront of at least one of said at least two subfields in dependence on the wavelength are arranged at the interior of said resonator(Fig. 10).

As to claim 77/49, Weitzel teaches wherein said means for generating an interference pattern by superimposing said at least two subfields comprises one of a retroreflector or a dieder(claim 15).

As to claim 78/49, Weitzel teaches wherein said means for generating an interference pattern by superimposing said at least two subfields further comprises means for rotating at least one optical component to adjust spatial frequencies of said generated interference pattern(claim 17).

As to claim 79/78, Weitzel teaches wherein said means for rotating at least one optical component causes one of a simultaneous shift or modulation of the relative phase of at least one of said at least two subfields with respect to at least one other of said at least two subfields being superimposed to generate said interference pattern(claim 17).

As to claim 80/49, Weitzel teaches wherein said apparatus further comprises one of a spectrally selective filter and a spectrally selective detector(Fig. 16, mask).

With regard to claim 49, Weitzel teaches a method for determining one of an optical spectrum of a light field to be examined and spectral properties of the light

field to be examined using an interferometric apparatus, the method comprising(pages 16-20):

(a) coupling in said light field to be examined(Fig. 15; page 15)

(b) splitting said light field into at least two subfields(Fig. 15; page 15)

(c) generating an interference pattern by superimposing said at least two subfields(Fig. 15; page 15)

(d) changing one of a shape or a direction of propagation of the wavefront of at least one of said at least two subfields in dependence on the wavelength, thereby causing each different spectral component with a discriminative wavelengths of said single spatial mode of an incoming light field to generate a different of said interference pattern(Fig. 15; page 15);

(e) measuring the intensity of said generated interference pattern at a plurality of discrete spatial positions(Fig. 15; page 15);

(f) generating a numerical representation of said interference pattern using the values of said measurements of the intensity of said interference pattern(page 16);

(g) calculating one of said optical spectrum or said spectral properties by numerical analysis of said numerical representation of said interference pattern by correlating said numerical representation of said interference with certain base patterns(page 16);

wherein said base patterns correspond to numerical representations of said interference patterns for corresponding basic spectral features(page 16).

Weitzel fails to teach coupling in a single spatial mode of said light field to be examined

As to claim 82/81, Weitzel teaches wherein said calculating step for performing a numerical analysis of said numerical representation of said interference patterns comprises performing one of: a Fourier transformation of said numerical representation, a Hartley transformation of said numerical representation, or a mathematical transformation to represent said interference pattern as a linear combination of sinus or cosinus functions(page 17).

As to claim 83/81, Weitzel teaches wherein said calculating step for performing a numerical analysis of said numerical representation of said interference pattern comprises decomposition of said numerical representation of said interference pattern according to a set of base patterns dependent on said interferometric apparatus(page 16).

As to claim 84/83, Weitzel teaches wherein said base patterns required for said decomposition are gained based on a measurement(page 16).

As to claim 85/84, Weitzel teaches wherein the determination of said base patterns includes further includes the step of measuring the intensity of different interference patterns according to different relative phase positions of said subfields(Fig. 15; page 16).

As to claim 86/81, Weitzel teaches wherein said step of measuring the intensity of an interference pattern at a plurality of discrete spatial positions and said step of generating a numerical representation of said interference pattern using the values of said measurements of the intensity of said interference pattern further includes the step of measuring the intensity of different interference patterns according to different relative phase positions of said subfields(Fig. 15; page 16).

As to claim 87/83, Weitzel teaches such that respective numerical transformations or functions of said numerical representation of interference patterns and said base patterns are used instead of said numerical representation of interference pattern and said base patterns(Fig. 15; page 16).

As to claim 88/81, Weitzel teaches determining the difference of the optical path lengths of the subfields brought to interference for each of the said individual measurement points at a plurality of discrete spatial positions of said interference patterns(page 18) and sorting the individual measured values in accordance to the difference of the optical path lengths of the partial fields brought to interference respectively determined from the measurement point(page 18).

CLAIMS 49, 57, 58, and 81:

Applicant's prior art reference teaches everything except that the light field to be examined is coupled into the interferometer as a single spatial mode.

Sampei et al teach coupling into an interferometer a light field to be examined with a single spatial mode(**column 3, lines 37-40**). Mode selection is performed using a spatial filter 11 or a single mode optical fiber(**column 3, line 39**). By using a single mode of the incoming light field a Gaussian intensity distribution of the wavefront is obtained. A wavefront having a Gaussian intensity distribution provides mutual coherence between all points on the wavefront.

With regard to claims 49, 57, 58, and 81; it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Weitzel by replacing the spatial filter E with a spatial filter that passes a single mode of the incident light field. The spatial filter can be either a plate or the end of a single mode fiber.

The motivation for this modification is found in both Weizel and Sampie et al. Weitzel teaches that a sufficiently small entrance surface is desirable (**page 17**), but provides no specific parameters for the sufficiently small size. Sampie et al teach that a single mode input provides a wavefront with a Gaussian intensity distribution which provides mutual coherence between all points on the wavefront. One of ordinary skill in the art would realize that with mutual coherence of the wavefront, alignment of the interferometer paths so as to interfere the different spatial frequencies would be simplified. Claims 50-56, 59-80, and 82-88 are dependent from claims 49 or 81 and therefor are also included in the rejection.

Relevant Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Roesler et al(5,059,027), see figure 2; Horton(5,777,736), see figure 8; Ranalli(6,362,879), see figure 3; And Meigs(6,687,007), see figure 3.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Turner whose phone number is 571-272-2432.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached on 571-272-2800 ext. 77.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Samuel A. Turner
Primary Examiner
Art Unit 2877